SYNTAX ZX80®

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SINCLAIR 8K ROM SOFTWARE

Sinclair now offers cassette programs for the ZX80 and ZX81 (story p.2) with 8K ROM. These tapes include education, games, and business and home programs. Two more tapes, Junior Education (1K RAM) and Z80 Assembler (16K RAM), for writing Z80 machine code, will be ready by April.

Also available in April or May will be a Learning Lab from Sinclair for the ZX81 and Language Learning, a set of programs to teach modern languages. Sinclair will send a catalog of 8K ROM software with each delivered 8K ROM and tapes will be available in the US. Sinclair has no plans to produce software for the 4K ROM.

8K ROM PRINTER COMMANDS:
LLIST--Lists to printer instead of screen, LPRINT--Directs output to printer instead of screen, COPY--Outputs screen display to printer.

CLASSIFIED ADS IN SYNTAX

Now you can buy, sell or swap plans, software or hardware with other ZX80 and MicroAce owners with SYNTAX classified ads. Reach hundreds of readers for only $2.75 per line (minimum 4 lines). Send your ad copy, typed 35 characters per line, to Classified Ads, SYNTAX ZX80, RD2 Box 457, Bolton Rd, Harvard, MA, 01451. Please include a check with your copy. No credit card or telephone orders. We need your ad by the 15th of any month to appear in the next month's issue. Include your name and address in each ad.

NEW PRODUCT UPDATES

Latest on Sinclair's new ROMs and RAMs--both are in production and distribution in the UK and Sinclair US expects to receive units shortly. However, Nigel Searle of Sinclair can make no promises, and says that owners are receiving their ROMs and RAMs in the same order thay bought their computers. Thus North American owners must wait until the European demand is satisfied.

Sinclair's 32 Column printer, using aluminized paper, will be available in the UK in June. North American customers can expect to wait until some time after that to order. The printer will work with both the ZX80 with 8K ROM and the new ZX81, and will work with the 16K RAM pack.

No word on other previously announced products still awaiting RAMs or ROMs. MicroPeripheral Corp. is still working on their modem design.

BACK ISSUES AVAILABLE

Volume 1 of SYNTAX, consisting of the November and December issues, is being reprinted as a single combined issue. New subscribers can order the Nov/Dec issue for only $5.00. Send your name, address and check for $5.00 or credit card number with expiration date to SYNTAX, RD 2 Box 457, Harvard, MA, 01451.

We also have limited numbers of the January, February, and March issues left, available for $4.00 each. Catch up on all the stories.

SINCLAIR ANNOUNCES ZX81 COMPUTER

Sinclair Research unveiled a new computer at a press conference in England in mid-March. The ZX81 comes with the same 8K ROM that will be available for ZX80s and 1K RAM and sells for 30% less than the original ZX80. Sinclair does not plan any export sales so far, and has not submitted the ZX81 for FCC approval in the US.

The new machine is smaller than the ZX80, measuring 6.3x6.8 x1.5 inches. It operates in 2 software-selectable modes, fast and slow. Fast is 4 times the speed of slow, and according to Sinclair, compares favorably with other personal computers. The slow mode permits continuous display even while calculating. Sinclair replaced 17 TTL chips with a custom-built chip and included only 1 RAM chip, so the ZX81 has only 4 chips altogether.

The ZX81 will also be available in the UK in kit form for about $100 US.

USING 8K ROM, 16K RAM ON MICROACES

According to Andy Fisher of MicroAce, Sinclair's 8K ROM and 16K RAM pack are completely compatible with MicroAce machines with minor modifications. Andy's instructions:

For 8K ROM: Your MicroAce kit has 2 track cuts on board (both sides of pin 21 of ROM chip) and you made 2 links on the board. Before installing the new ROM, repair the cuts using a small piece of wire and remove both links. Cut the track going to pin 13 (data line 3) and the one going to pin 14 (data line 4) of the old ROM. With a small piece of wire, make a link between the sockets of pin 13 of the ROM chip (on the PCB) and pin 18 of U6. Also link pin 14 of the Rom chip and pin 3 of U6. Now plug the new ROM chip into its socket and apply power.

For 16K RAM: If you have a 1K MicroAce, the 16K RAM plugs in with no changes. If you have a 2K model, remove the extra 1K along with U17. Be sure that the 2.2K resistor in the place of R16 is installed! Now plug in the 16K module.

MicroAce Owners--Sinclair's owner's manual is available by mail from Sinclair Research, 1 Sinclair Plaza, Nashua, NH, 03061, or Image Computer Products. 615 Academy Dr., Northbrook, IL, 60062, for $5.95.

OUR POLICY ON CONTRIBUTED MATERIAL

SYNTAX ZX80 invites you to express opinions related to the ZX80 and the newsletter. We will print, as space allows, letters discussing items of general interest. Of course, we reserve the right to edit letters to a suitable length and to refuse publication of any material.

We welcome program listings for all levels of expertise. Programs can be for any fun or useful purpose. We will test run each one before publishing it, but we will not debug programs; please send only workable listings.

In return for your listing, we will pay you a token fee of $2.00 per program we use. This payment gives us the nonexclusive right to use that program in any form, world-wide. This means you can still use it, sell it, or give it away, and so can we.

We will consider submissions of news and hardware or software reviews. Please keep articles short (350-400 words). Again, we reserve the right to edit accepted articles to a suitable length. We will pay 7 cents per 6 characters, including spaces and punctuation, for accepted articles.

When you send in programs for possible publication in SYNTAX, please include the following information:

- How to operate the program, including what to input if it does not contain prompts.
- Whether you can run the program over again and how.
- How to exit the program.
- The Syntactic Sum (using the Syntactic Sum program in the February, 1981, issue).
- Whether it fits in 1K or 2K RAM (or 16K when available).

We pay for this explanatory text at the same rate as for articles in addition to payment for the program itself.

If you want us to return your original program listing or article, please include a self-addressed, stamped envelope. Otherwise, we cannot return submitted material.

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HOG HEAVEN—ROM ENTRY POINTS

For our readers, SYNTAX ZX80 obtained this complete list of global subroutine calls for the 4K ROM's eight software modules.

Mapped here you will find the name and absolute hex address for each global subroutine. We show first and last byte locations and the module length, also in hex. To convert to decimal, see our Mar. 81 story on number systems.

In later issues we plan to publish detailed descriptions of some subroutines and we expect to offer readers the opportunity to obtain the annotated ROM listing.

BASIC	
FIRST	ØØØØ
LENGTH	Ø13C
LAST	Ø13B
IGN_SP	ØØ1A
NXT_IS	ØØ2Ø
N_EXPR	ØØ25
P_EXPR	ØØ49
NEXTCH	ØØ52
NC_HL	ØØ55
KB_TAB	ØØ6C
TOKENS	ØØBA

IO	
FIRST	Ø13C
LENGTH	Ø11A
LAST	Ø255
DISP	Ø13F
SAVE	Ø1B6
LOAD	Ø2Ø6

EDIT	
FIRST	Ø256
LENGTH	Ø3B4
LAST	Ø6Ø9
K_LIST	Ø256
INIT	Ø261
NEWLIN	Ø283
DONE	Ø2F7
DELSYM	Ø36C
BLEEP	Ø3A7
WR_DIG	Ø54C
PUTDIG	Ø556
PUT_CH	Ø559
SENDCH	Ø56Ø
PUTSYM	Ø584
SYMTXT	Ø5A8
FILLDF	Ø5C2
INSERT	Ø5D5
REMGSZ	Ø5DF

LIST	
FIRST	Ø6ØA
LENGTH	Ø148
LAST	Ø751
FIND_L	Ø6ØA
CP_BC	Ø61C
RECLEN	Ø624
DEL_V	Ø65B
DELREC	Ø666
NUMBER	Ø679
PUT_BC	Ø6A1
PUT_LN	Ø6BF
SET_SP	Ø6EØ
USR	Ø6FØ
PRINT	Ø6F1
WR_NL	Ø71B
WR_TAB	Ø727
CLS	Ø747

SYNTAX	
FIRST	Ø752
LENGTH	Ø35B
LAST	ØAAC
SYNTAX	Ø7BE
SYNERR	Ø8AE
CHK_SZ	Ø94F
CHK_L	Ø958
LEØ5	Ø9E1

IDENT	
FIRST	ØAAD
LENGTH	Ø272
LAST	ØD1E
IDENT	ØAAD
FIND_V	ØB3B
LET	ØC3D
DIM	ØCD3
LCU2	ØCF3
X_TEMP	ØDØA
ALPHA?	ØD14
ALNUM?	ØD18

OPNS	
FIRST	ØD1F
LENGTH	ØØE1
LAST	ØDFF
OPNTAB	ØD1F
MUL	ØD55
OPNØ9	ØDCD
ABS	ØDF2

CH_SET	
FIRST	ØEØØ
LENGTH	Ø2ØØ
LAST	ØFFF

HARDWARE NOTES

►Ed Haasch of Greenfield, MI, suggests that you use a DIP header in place of U17 and not remove R16 to connect expanded RAM to your MicroAce. (see "Build Additional RAM" Mar, 81.) By leaving R16 in place, you can use your original 2K by plugging U17 back in. Pins 2 & 4 carry the $\overline{RAM}$ signal. Pin 3 is $\overline{CS1}$ & pin 6 is $\overline{CS2}$.

To use a Radio Shack 40-pin connector to connect additional RAM, run a jumper from data line 7' (pin 1T) to pin 23B instead of using that space for $\overline{RAM}$. (But see the ZX81 pinout following.)

We got some surplus 100-pin connectors and cut 46-contact sections from them (23 top and 23 bottom contacts to fit the ZX80 bus). Two hints: First, use a hacksaw blade made for cutting hard materials--the housings are glass-filled. Also, cut on an extra contact point and sand the housing down to size to avoid removing insulation next to the end contact.

►Sinclair's new ZX81 uses all the edge connector pins with minor changes. Pin 23B is now used for $\overline{ROM\ CS}$, pin 2T becomes $\overline{RAM\ CS}$, and pin 12T becomes $\overline{NAY}$. Because Sinclair's printer is compatible with both designs, you may want to remember their pin assignments when you assign pins for your designs.

►Some video monitors need external sync signals instead of composite video. For these devices, you must supply vertical and horizontal sync pulses to separate terminals.

You can pick up the vertical sync pulses at IC11 (U22) pin 12 for negative-going pulses or pin 10 for positive pulses. Pick up combined horizontal and vertical sync pulses at IC19 (U13) pin 5 for negative signals or pin 6 for positive signals.

Video output appears at pin 4 of IC 20 (U18) after the reversing switch. Composite video appears at the junction of R30 and R32.

►Mike Neidich of Syosset, NY, suggests adding a reset switch to avoid having to pull the power plug after every crash. Connect a normally open, momentary contact pushbutton across C10 (C2 in a MicroAce). Mike says the best attachment points are at the left end of R4 and the modulator's zero-volt lead. Drill the rear of the case to mount the button.

►Use your cassette's built-in loudspeaker for monitoring while loading. Ted Millen, Don Mills, Ontario, gives these instructions. On the earphone jack, find the two solder points that short together when the jack is removed. Solder a quarter-watt, 100 Ohm resistor across these terminals to feed the speaker when the computer plug is inserted. This technique provides ample monitoring volume and does not affect the computer feed.

SOFTSYNC SOFTWARE

Softsync, Inc., offers ZX80 Invasion, a Space-Invaders-like game. Softsync says it uses 1K RAM. ($14.95 + $1.50 shipping.) Softsync, Inc., PO Box 480, Murray Hill Sta., New York, NY, 10156.

BAR GRAPHICS

This program, written for a 2K MicroAce, draws bar charts on a white background with dark defined lines and a graphpaper-like effect behind the bars. It will choose 10 (Ø to 10) random numbers to graph, or you can select them. Line 110 & 120 use SHIFT A; Lines 121, 122 & 133 use SHIFT S.

Joe Chaiet, New Paltz, NY

Note: This program won't fit in 1K unless you delete some lines and improve the IF-THEN sequence efficiency. Any takers?--AZ

```
   1 DIM U(5Ø)
   2 LET T=Ø
   3 RANDOMISE
   4 PRINT "DO YOU WANT A RANDOM
 GRAPH OR"
   5 PRINT
   6 PRINT "DO YOU WANT TO ENTER
 1Ø NUMBERS?"
   7 PRINT
   8 PRINT "SELECT (1 OR 2)"
  1Ø INPUT Z
  11 IF Z>1 THEN GO TO 19
  15 FOR X=1 TO 1Ø
  16 LET U(X)=RND(1Ø)
  17 NEXT X
  18 GO TO 6Ø
  19 CLS
  2Ø PRINT " THIS PROGRAM WILL P
RINT A GRAPH"
  21 PRINT "OF 1Ø NUMBERS FROM Ø
TO 1Ø"
  23 PRINT
  25 PRINT "ENTER"
  3Ø FOR X=1 TO 1Ø
  4Ø PRINT "NUMBER ";X;
  45 INPUT U(X)
  46 PRINT "?"; U(X)
  5Ø NEXT X
  6Ø CLS
  65 FOR X=1 TO 32
  68 PRINT CHR$(128);
  7Ø NEXT X
  72 PRINT
  75 LET X=11
  8Ø FOR W=1 TO 1Ø
  9Ø LET X=X-1
  91 PRINT CHR$(128);
  92 PRINT CHR$(X+28+128);CHR$(2
);
 1Ø5 LET T=T+1
 1Ø7 IF T>1 THEN PRINT CHR$(128);
CHR$(128); CHR$(2);
 1Ø9 FOR Y=1 TO 1Ø
 11Ø IF U(Y)>X THEN PRINT "▒▒";
 12Ø IF U(Y)=X THEN PRINT "▒▒";
 121 IF Y=1Ø AND T=1 AND U(Y)<X
THEN PRINT "▚▚";
 122 IF Y=1Ø AND T=1 AND U(Y)<X
THEN GO TO 14Ø
 125 IF T=1 AND U(Y)<X THEN PRIN
T "▚▚";
 126 IF T=1 AND U(Y)<X THEN GO T
O 14Ø
 13Ø IF U(Y)<X THEN PRINT CHR$(1
28);CHR$(128);
 133 IF Y<1Ø AND T=1 THEN PRINT
"▚";
 134 IF Y 1Ø AND T 1 THEN PRINT
CHR$(128);
 14Ø NEXT Y
 15Ø PRINT
 155 IF T<2 THEN GO TO 98
 156 LET T=Ø
 16Ø NEXT W
 163 PRINT CHR$(128);CHR$(128);
CHR$(133);
 165 FOR X=1 TO 29
 166 PRINT CHR$(3);
 167 NEXT X
 168 PRINT CHR$(128);CHR$(128);

 17Ø FOR X=1 TO 1Ø
 175 IF X=1Ø THEN PRINT CHR$(12
8);CHR$(U(X)+128+28);CHR$(128)

 179 IF X=1Ø THEN GO TO 19Ø
 18Ø PRINT CHR$(128);
 181 PRINT CHR$(U(X)+128+28);CHR
$(128)
 19Ø NEXT X
 191 STOP
SYNTACTIC SUM=21956
```

DEAR EDITOR

I found a way to eliminate distracting interference patterns, requiring only patience and lots of tin foil. Just wrap the TV adaptor and antenna terminals with the foil. If done neatly with no punctures, the shield covers both adaptor and antenna terminals. For complete shielding, insert the adaptor into the TV and completely cover the sides of the TV, being careful not to ground anything with the foil. This plan uses Gauss's law--no electrical field exists within hollow spherical conductors.

Joseph Mariconda, Toronto, Ontario

You can save several bytes in REM or PRINT statements by using single-key keywords where possible instead of entering words letter by letter. For example, to remind yourself to write down some data, you might have a line:

```
100 PRINT "STOP THEN INPUT X,Y,Z"
```

Letter by letter, the whole line consumes 27 bytes. But if after the line number you hit I for INPUT, SHIFT 5 to move the cursor left, Shift 3 for THEN, SHIFT 5, S for STOP, SHIFT 5, O for PRINT, SHIFT Y for ", SHIFT 8 3 times to move cursor past INPUT, and finish out X,Y,Z" you can consume only 14 bytes, a savings of 1/2. When you have only 1K of user memory, every byte helps.

Rolf L. Miller, Ventura, CA

I adapted the memory test program in the Additional RAM story last month (p.3) to work in my 1K ZX80. I changed line 10 to:

```
10 FOR I=152 TO 987
```

This program runs successfully. But when I change line 10 to:

```
10 FOR I=152 TO 988
```

I get error code 9/80 but it prints error at 17372 twice. This indicates that the memory address at 17372 is unavailable. If I change the high number in line 10, it prints error messages for all addresses from 17372 to 17403. In a previous issue of SYNTAX, you said the largest available address was 17408. This seems to be a loss of 36 bytes. What gives?

John A. Sampson, College Point, NY

As you saw, the program in the March issue ended at 8000, not 8192 (8x1024, or the new total bytes available with the 8K RAM). Your machine keeps a variable length reminder file, or stack, at the top (high addresses) of total memory. By checking only up to 16384+8000, we avoided the stack area, simplified the test program and got a memory check adequate for our purposes. You POKEd high addresses in your 1K RAM; the computer used (and changed) them before you PEEKed at the contents. So it didn't see what you POKEd and gave an error.

Every time your computer powers up or executes NEW, it checks to see how much memory is connected. Use this machine code program, courtesy of Sinclair, to see the number of bytes found:

```
1 POKE 17000,33
2 POKE 17001,11
3 POKE 17002,0
4 POKE 17003,57
5 POKE 17004,201
6 PRINT USR(17000)-16383
```

On 1K machines, the answer will be 1024, or 2048 on 2K machines.--AZ

I was using a 19" color TV as a monitor with my MicroAce and absent-mindedly touched the screen and the keyboard at the same time. ZZZAP!! The static discharged through my body into the keyboard and the U11 buffer. It died on the spot. A local distributor told me that the NSC 74LS365 did not have input diode protection,

although other brands do. Because this chip is required, users should be careful when operating near a TV screen and in the dry winter months. Static charge can definitely cause damage to the expensive MOS circuits (the Z80A & ROM) and the keyboard buffer.

Mike Neidich, Syosset, NY

To avoid static problems, don't touch both your TV screen and computer at the same time. Don't wear wool clothes, or other fibers that generate static. Discharge static in your body before touching the computer by touching a metal object (you'll get a small shock), especially if the room is carpeted.--AZ

After I assembled my MicroAce kit and inserted the recommended jumpers, it worked perfectly for about a week. Then the cursor motion in 3 directions, quotation marks and opening parenthesis became erratic and stopped working altogether. With nothing but blind instinct to guide me, I found that tying the positive end of diode 5 to ground through a .68 Meg resistor solved the problem.

Steve Martinez, Albuquerque, NM

These readers would like to contact others in their areas. If you want to hear from readers in your area, send us your name, address and phone number. We'll publish your request when space permits--AZ

*Marshall G. Olsen, 2030 Larrabee St., Chicago, IL, 60614

*Mario Stocco, 144 Lucan St., Apt. 105, Waterloo, Ontario, N2S 1W7

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SOFTWARE REVIEW: CHEST OF CLASSICS BY LAMO-LEM

Lamo-Lem of La Jolla, CA, offers 4 classic games on 1 cassette for $9.95. These games are Lunar Lander, K Trek, Mindmaster, and Life. The chest includes a game book giving clear directions, sample program runs, and winning strategies. Chest of Classics also includes loading instructions applicable to any cassette, game guide cards summarizing directions and commands, a custom software survey, and program coding sheets.

Lunar Lander is similar to the video game of the same name. You must land your lunar module without crashing. You choose your burn time, keeping a careful eye on both velocity and fuel level. The graphics are not bad, although the lander crashes through your instrument panel during an unsuccessful try. The program ignores invalid entries. (By the way, I've never beaten this game.)

In K Trek you command a Klingon battle cruiser. Your mission--to destroy the Federation starships before your energy runs out. This game's graphics are OK, but the tiny display uses only 1/6 of the screen. All in all, a more fun game than the first, giving you a helmsman's console and scanner, warp drive, impulse engine, and phasor capabilities shown on a keyboard overlay. The program ignores invalid entries. (I have yet to win this game.)

Mindmaster is like the number guessing game, but uses graphics symbols instead of numbers. This version is more challenging. You choose your difficulty level (2-1Ø) and deduce the correct symbols plus their order in fewer than 8 tries. The display in this game is better than the first 2. This game also has a special keyboard overlay defining only those keys needed to play. If you enter an invalid symbol, the program displays it but scores Ø points for it.

Life gives you a 15x16 grid to fill with living cells in any array you choose. These colonies grow according to rules in any number of generations you choose. The Chest includes a reprint from BYTE describing the mentally stimulating potential of this game. The graphics are good; the display only uses 1/2 the screen but is large enough to see easily. Life uses machine language to efficiently store the instructions in a limited memory.

Each of these programs fits easily in 1K RAM. We could not load from the tape until we used a recorder with a higher volume level. Conan LaMotte of Lamo-Lem said he would record future tapes at higher volume. I was fooled the first time I tried to load these programs because no audible buzz precedes each one. We

re-recorded each program on our own tapes (a good idea for valuable software) adding buzz time and now they load perfectly. Each program except Life is hard to exit; the instructions do not tell you how to do this. Try breaking while the screen is blanked.

COMPUTER NUMBER SYSTEMS III

In the last 2 issues we learned about hexadecimal and binary numbers, 2 systems used by computers. Now we'll look at octal numbers.

Octal, or base 8, numbers work just like binary, hex, or decimal numbers. Each digit represents a power of the base you're working in, so an octal number is expressed as powers of 8. And as in decimal you have 10 digits and binary you have 2, in octal you have only 8 digits, Ø-7.

Thus 12 in decimal stands for $1x10^1$ plus $2x10^0$. In octal, 12 means $1x8^1$ plus $2x8^0$, or 10 in decimal. (Remember that any number to the zero power=1.)

Octal numbers are most useful for computers whose word lengths are multiples of 3 (the ZX80 word is 8 bits). Also all old business machines, like mechanical adding machines, worked in base 8.

This conversion program by Don Richardson of Hampton, VA, translates numbers to any base up to base 36. Each digit of the new number represents a power of that number, so $ABC_D=AxD^2+BxD^1+CxD^0$. To run the program, press RUN (NL) and just answer the prompts, hitting (NL) after each. Do not ask it to convert to base 1. Because base 1 has only the digit Ø, the only number you can practically represent is Ø and the computer will run interminably.

```
  1Ø CLS
  2Ø PRINT "WHAT BASE? (ENTER 1Ø
 IF YOU WANT"
  3Ø PRINT "TO GO FROM BASE 1Ø T
O ANOTHER"
  4Ø PRINT "BASE, OR ELSE ENTER
THE BASE"
  5Ø PRINT "TO CONVERT FROM)"
  6Ø INPUT B
  7Ø CLS
  8Ø IF B=1Ø THEN GO TO 23Ø
  9Ø PRINT "WHAT IS THE NUMBER?"
 1ØØ INPUT A$
 11Ø CLS
 12Ø PRINT A$;" BASE ";B;"=";
 125 LET PN=1+2*(CODE(A$)=22Ø)
 127 IF CODE(A$)=22Ø THEN LET A$
=TL$(A$)
 13Ø LET X=Ø
 14Ø LET Y=CODE(A$)-28
 15Ø IF Y<B THEN GO TO 18Ø
 16Ø PRINT "A NON-LEGAL NUMBER O
F BASE ";B
 17Ø GO TO 39Ø
 18Ø LET X=B*X+Y
 19Ø LET A$=TL$(A$)
 2ØØ IF NOT A$=CHR$(1) THEN GO T
O 14Ø
 21Ø PRINT PN*X;" BASE 1Ø "
 22Ø GO TO 39Ø
 23Ø PRINT "WHAT BASE ARE YOU CO
NVERTING TO?"
 24Ø INPUT B
 25Ø CLS
 26Ø PRINT "WHAT IS THE BASE 1Ø
NUMBER?"
 27Ø INPUT Y
 28Ø CLS
 29Ø PRINT Y;" BASE 1Ø=";
 295 IF Y<Ø THEN PRINT "-";
 297 LET Y=ABS(Y)
 3ØØ LET N=-1
 31Ø LET N=N+1
 32Ø IF NOT Y/B**N<B THEN GO TO
31Ø
 33Ø FOR I=Ø TO N
 34Ø LET X=B**(N-I)
 35Ø PRINT CHR$(Y/X+28);
 36Ø LET Y=Y-(Y/X)*X
 37Ø NEXT I
 38Ø PRINT " BASE ";B
 39Ø PRINT
 4ØØ PRINT "DO YOU WANT ANOTHER
CONVERSION?"
 41Ø INPUT A$
 42Ø IF CODE(A$)=62 THEN GO TO 1
Ø
SYNTACTIC SUM=-6933
```

BEGINNER'S COLUMN--
ERROR CODES AND DEBUGGING PROGRAMS

One of the ZX80/MicroAce's nicest features keeps you from entering lines with syntactic errors into a program. This saves you much time and irritation in trying to get your programs to run. But some errors in logic can get by the line checker and your program won't run, usually because you've asked the impossible or you haven't given complete enough instructions. Remember, the computer won't know what you want unless you tell it specifically.

Fortunately, the machine tells you exactly where the program screwed up. It runs the program as far as possible, then gives you an error code and the line number where the problem occurred. They appear at the bottom left of the screen as error number/line number in a ZX80 and error number:line number on a MicroAce. Error codes are on page 99 of a ZX80 manual and page 54 of a MicroAce manual.

These error codes can be invaluable in helping you debug your program. Error code Ø means it ran with no problems. Error code 9 means it ran with no problems until it hit a STOP statement. But if you get an error code 1-8, you have trouble.

Error code 1 means you set up a FOR-NEXT loop like FOR X=1 TO 1Ø ... PRINT X ... NEXT T. The computer doesn't know what NEXT T means (assuming you defined T) because X, not T, is the control variable for the FOR-NEXT loop. Make sure you use variable names consistently.

Error code 2 means that you threw in a variable without defining it. Work back from the offending line and make sure that every letter variable you use has a line to define it. In the FOR-NEXT loop example above, FOR X=1 TO 1Ø defines the variable X. Statements like LET A=Ø or INPUT A$ define A and A$. Note the difference between the variable A and the string variable A$. Defining one does not define the other although they use the same letter. The most common source of this error is just mistyping a variable name.

Error code 3 occurs when you use a subscript greater than the maximum in an array you set up using a DIM statement (more on DIM statements later). For example, if your array A has 5 elements and you use A(1Ø), you'll get an error 3. A subscript that is an expression, like A(2*I), that evaluates to greater than the maximum subscript in the array also gives error 3.

Error code 4 occurs with LET, INPUT, DIM or PRINT statements and means that you've overshot the limit on the number or length of variables you can use because there isn't enough memory for all

of them. Variable names and strings can be any length, but can use up only as much memory as you have. Your only solution is to shorten something in the memory, like the variables, screen display or program length.

Error code 5 comes only from PRINT statements and means you ran out of display room on the screen. The best cure for this is just to cut the stuff you want to print.

Error code 6 means the answer to a calculation has gone over 32767 or under -32768, the largest and smallest numbers the computer's arithmetic register can handle. Just ask it to calculate a smaller number. Sometimes all you need to do is use brackets in a long calculation to make sure the running total never exceeds the limits.

Error code 7 means the computer hit a RETURN statement with no corresponding GO SUB. Subroutines consist of a GO SUB statement that sends the computer to the subroutine and end with a RETURN statement to send it back to where it left. If it finds a RETURN with no GO SUB to go back to, it's lost and stops. (See Dec., 1980 issue on subroutines.)

Error code 8 occurs when you try to use INPUT as a direct command instead of as a program command. To avoid this error, only use INPUT as part of a program line.

You can use most other commands directly, not as part of a program. Our trick for finding out how much memory is left is one example: typing PRINT 17408-PEEK (16400)-PEEK(16401)*256 gives you bytes remaining and an error code Ø/-2. These kinds of commands give error code Ø in lines -1 or -2, but do not mean that you had an error in the line. Other direct commands, like GO TO (a line number), do not give error codes. GO TO functions like RUN if you GO TO the first line of the program; if you GO TO a later line the computer executes the program from that line on. This can also help you find errors in your program by showing you which parts run and which don't. Try inserting marker PRINT lines, like PRINT "OK SO FAR", in the middle of calculations to see how far the computer gets before the problem occurs. This narrows the possibilities for guilty lines. The other difference between GO TO and RUN in executing a program is that RUN clears all the variables you may have already entered in the program; GO TO preserves them.

SYNTAX

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First Class